

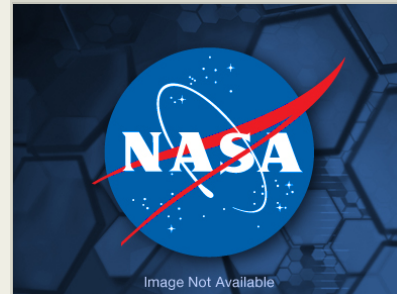
Characterization of the Time Projection X-ray Polarimeters for GEMS and XACT

Completed Technology Project (2014 - 2017)



Project Introduction

X-ray Polarization measurements demand sensitive and well-calibrated and characterized instruments and the careful control of potential systematic errors in the measurements. Sensitivity is required as the sources may be faint and the polarized fraction of the signal may be small; sensitivity to fractional polarizations of one percent typically requires 106 or more photons. Robust calibration is essential so that subtle features of the instrument response are not mistaken for astrophysical signatures. After decades without dedicated polarimetry instruments, advances in micro-pattern gas detectors are being exploited, in our laboratory and elsewhere, to develop and propose instruments with sensitivity capable of studying dozens of targets per year even in a small mission. The program proposed here addresses calibration and systematic errors, and will demonstrate that the detectors and instruments are well enough understood to enable statistics limited measurements at the one percent level. We propose a sub-orbital flight with the GSFC developed Time Projection Chamber (TPC) X-ray polarimeters to demonstrate that neither misalignments in instrument integration or mission pointing nor intrinsic detector asymmetries limit our ability to perform sensitive statistics-limited measurements. While our instrument design and observing strategy should control the systematic uncertainties in TPC polarization measurements to the $< 1\%$ level, a rocket flight will provide an actual end-to-end test of the whole measurement process. A successful flight will also advance the technology to TRL-7. This program directly addresses two of the three specific factors to be evaluated in assessing merit of APRA proposals (advancement of detector technology readiness; advancement of junior researchers) and promotes the third (intrinsic scientific merit) by demonstrating that an enabling technology can adequately control systematics. While sub-orbital demonstration of the ability to control systematics is not required prior to a dedicated polarimetry mission, it provides the most efficient route to retire this performance risk.



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Table of Contents

Project Introduction	1
Organizational Responsibility	1
Primary U.S. Work Locations and Key Partners	2
Project Management	2
Technology Areas	2
Target Destination	2

Organizational Responsibility

Responsible Mission Directorate:

Science Mission Directorate (SMD)

Responsible Program:

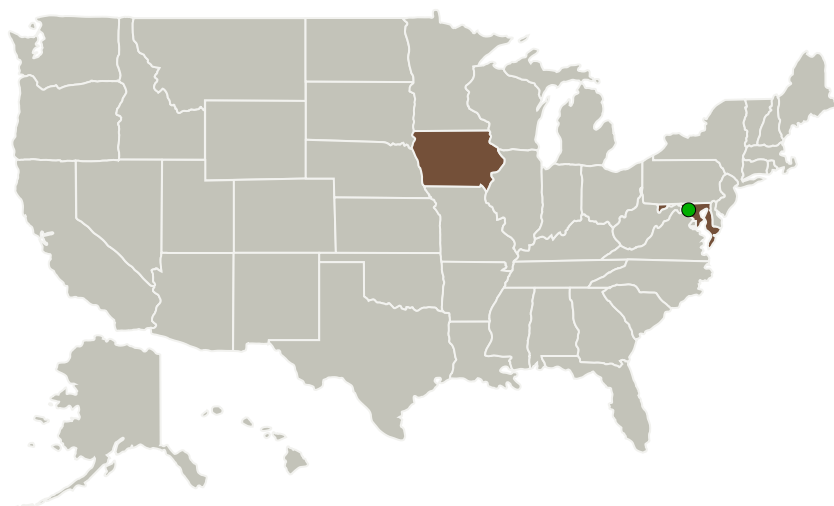
Astrophysics Research and Analysis

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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
● Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland

Primary U.S. Work Locations	
Iowa	Maryland

Project Management

Program Director:

Michael A Garcia

Program Manager:

Dominic J Benford

Principal Investigator:

Keith M Jahoda

Co-Investigators:

Philip Kaaret
Keith C Gendreau
David T Leisawitz
Joe Hill
Kevin Black

Technology Areas

Primary:

- TX08 Sensors and Instruments
 - └ TX08.1 Remote Sensing Instruments/Sensors
 - └ TX08.1.1 Detectors and Focal Planes

Target Destination

Outside the Solar System